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ACRONYMS

CfBO	Carbonaceous Biological Oxygen Demand
cfg	cubic feet per minute
cfs	cubic feet per second
EPA	United States Environmental Protection Agency
gpad	gallons per acre per day
gpd	gallons per day
gpm	gallons per minute
I&I	Infiltration and Inflow
I-5	Interstate Highway 5
MBR	Membrane Biological Reaction
MLS	mixed liquor suspended solids
ND	Not Detected
POTW	Publicly Owned Treatment Works
QAP	Quality Assurance Plan
QMP	Quality Management Plan
SAP	Sampling and Analysis Plan
TKN	Total Kjeldahl Nitrogen
UIC	Underground Injection Control

OWNER AND FACILITY INFORMATION

This section lists information describing the project owner and other facility information.

BASIC INFORMATION

Facility Name:	Quil Ceda Village Treated Wastewater Effluent Infiltration System.
Owner:	The Consolidated Borough of Quil Ceda Village, a federally-recognized Indian tribal village government affiliated with The Tulalip Tribes of Washington.
Name and Address of Legal Contact:	Mr. Reid Allision The Tulalip Tribes 8802 27 th Ave NE Tulalip, WA 98271
SIC Codes:	5399 – Miscellaneous General Merchandise Retail Stores 7011 – Casinos and Hotels
Type of Injection Well:	Class V wells; EPA Region X Ltr Mar 17, 2003
Operating Status:	Operational since May 2003
Related Permits:	No federal or state permits applied for or received. All environmental reviews have been completed by the Village.

STATUS AND LOCATION

Quil Ceda Village is a federally recognized Indian tribal village government chartered by The Tulalip Tribes of Washington. The Tulalip Tribes of Washington is a federally recognized Indian Tribe organized under Section 16 of the Indian Reorganization Act of 1934, 25 U.S.C. Section 461, et seq. The Tulalip Indian Reservation, located in the middle Puget Sound area bordered on the east by I-5 and the City of Marysville, on the south by the Snohomish River, on the north by the Fire Trail Road (140th Street NE), and on the west by the waters of Puget Sound (Exhibit 1). The Reservation exterior boundaries enclose a land base of 22,000 acres, over 60 percent of which is in federal trust status. The Reservation was established by the Point Elliott Treaty of 1855 and enlarged by Executive Order in 1873. The Tribes has more than 3,500 enrolled members, of which more than 2,000 live on the Reservation.

VILLAGE GOVERNANCE AND OPERATIONS

Exhibit 2 provides an organizational chart of Village government. Quil Ceda Village (Village) is managed by an elected/appointed Council. The General Manager is responsible for day-to-day management activities. Under the General Manager is a Public Works Director (position presently unfilled). Wastewater operations is one component of Quil Ceda Village public works.

Operation of the wastewater treatment plant and the effluent infiltration system is the responsibility of the Plant Operator. Currently, the Plant Operator is Tommy Gobin. Mr. Gobin has 20 years experience in wastewater operations and holds the following certifications for treatment plant operation:

- Group 3 Wastewater Treatment Plant Operation, Native American Water Association, Expires 2009.
- Group 1 Water Treatment Manager, Native American Water Association, Expires 2009.
- Group 1 Water Distribution Specialist, Native American Water Association, Expires 2009.
- HAZWHOPPR Operations.

Mr. Gobin has previously been responsible for:

- Wastewater Plant Operations.
- Wastewater Testing and Process Control.
- Manager, Tulalip Utilities Water and Wastewater (8 years).

INTRODUCTION

PURPOSE: This document contains the inventory and assessment information required for rule **re-authorization and amendment** of a Class V horizontal injection well system under the United States Environmental Protection Agency's (EPA) Underground Injection Control Program (40 CFR 144 and 40 CFR 146) **for injection of treated sanitary wastewater effluent** from Quil Ceda Village, a political subdivision of The Tulalip Tribes of Washington. Further, this application is for **authorization** of a pilot wetland with injection well to investigate habitat enhancement and migration of re-use waters to the local creek.

GOVERNANCE: The Consolidated Borough of Quil Ceda Village (Village) is a federally-recognized Indian tribal village government chartered by The Tulalip Tribes of Washington and is located just west of Interstate Highway 5 (I-5) between the 88th Street NE and 116th Street NE interchanges (exhibit 1).

FACILITIES: Currently, the Village consists of a casino, a 100 store retail shopping mall, and additional retail strip facility. A 400 room hotel is under construction. Ultimately, the Village may include amusement parks, recreation facilities and other businesses. This build-out is a twenty five year program.

WASTEWATER TREATMENT: Currently, **wastewater from existing Village facilities flows to a Village owned and operated wastewater ultra-filter membrane treatment plant (Kobota flat plate membranes)** located approximately one mile west of the 88th Street NE interchange with I-5. The treatment plant utilizes a membrane-lined reactor to produce **treated effluent that complies with federal drinking water standards**. This plant **began operation in May 2003**. All Village wastewater flow is routed to this plant; however, the option exists to continue to route up to 50,000 gallons of wastewater per day to the City of Marysville POTW.

VOLUME: Currently, wastewater flows to the Village plant at 120,000 gallons per day (gpd average). At full build-out in approximately twenty years, Village wastewater flow is projected to be up to a maximum peak of 4.0 million gpd. The base structure of the treatment plant is designed to allow rapid expansion to accommodate this flow rate.

EFFLUENT WELL: Treated plant effluent flows to an infiltration class V well system (see EPA Reg X Ltr Mar 17, 2003 at Exhibit 3). The Village obtained coverage under EPA's Class V UIC Program for this system. This original application with supporting documents is included in this document by this reference.

CLASS V WELL CAPACITY: The original limiting factor for this well injection effluent infiltration system was anticipated to be a hydraulic capacity (approximately 250,000 gallons per day, average basis). After a period of operation, hydraulic volumetric data has been collected (see exhibit 4) and compared to groundwater depth data (Exhibit 5). This data indicates the total system is capable of much higher infiltration. Within the next five years, wastewater flows are expected to be higher, but yet clearly within the hydraulic capacity of the infiltration well. If a build-out with major increased flows does occur earlier, the Village will prepare an NPDES Permit and provide for additional sites for this reuse water such as stream enhancement, facility use or forest irrigation. This application documents that **this well system is capable of flows more than 300,000 gpd per day with a factor of safety and infrequent peaks more than 600,000 gpd.**

LOCATION: The current horizontal infiltration well system, nearly 4,000 feet long, are located in a narrow strip of land parallel to and just west of I-5 **where depths to groundwater are greater (10 to 20 feet).** Groundwater drainage to Quil Ceda Creek begins to lower the regional water table just west of this area. This

well system will be referred to in this document hereinafter as the I-5 well(s).

SOILS AND GROUNDWATER ANALYSIS: In 2002, the Village evaluated options for infiltrating treatment wastewater to groundwater. The Village is underlain by an unconfined aquifer in sandy soils extending to several hundred feet below ground surface. Depths to groundwater over much of the Village are less than 5 to 10 feet, and in some cases are as little as 1 to 2 feet during the winter; therefore, some more shallow areas are not suitable for infiltration. The site selected for the I-5 operating system average 13 to 15 feet below surface with medium sands and a few interment thin unconsolidated layers of peat.

The Village completed a detailed investigation of the current I-5 infiltration area regarding hydro-geologic conditions in 2002. This work included completing 7 detailed soil borings, 8 cone penetrometer tests, 42 test pits, and 16 groundwater wells. Additionally, 4 long-term, high-volume infiltration tests were completed to evaluate aquifer properties and groundwater mounding. The information gathered from this study was supplemented by data from numerous other investigations of specific development sites around the Village. These other investigations have used soil borings, test pits, water level measurements, percolation tests, well pumping tests, and other methods to evaluate site conditions.

DATA COLLECTION: The Village collects data for the water quantity and quality in the effluent from the treatment plant. The data indicate the effluent meets drinking water standards with a high degree of reliability. Quil Ceda Village closely monitors and evaluates the actual wastewater flow rates versus projected flow rates, and closely monitors the hydraulic capacity of the effluent infiltration system, to ensure a decision to obtain an NPDES permit is made in a timely manner.

ADDITIONAL STUDY: In the interim and in preparation for the above described increase in flows, the Village desires to construct and operate a small limited flow pilot re-use wetland with class V infiltration well (hereinafter referred to as "Pilot Well(s)") to examine methods and techniques to pass this re-use water to Coho Creek in the most constructive and safe way while benefitting habitat and the natural environment.

OBJECTIVE: In anticipation of greater flows and with regulatory understanding and approval of this application package, we anticipate constructing a pilot wetland system as a 'no surface water discharge pilot investigation program' (*discharging to class V wells*) to determine the impact of this treated water on the environment, to determine how best to migrate water into existing surface waters, to investigate the phenomena of marking this water for anadromous fishes, and to investigate the nature of endocrine disruptors in the re-use water. This pilot program will provide for a series of wetland configurations with free flow regimen and subsurface flows with different plants and different plant growing media. Infiltration tests in this area indicate that the northern portion of this site will support infiltration flows at 50,000 gpd with a factor of safety. Groundwater at the site selected for the pilot wetland is 7 to 9 feet below surface. We plan on constructing this pilot wetland with class V infiltration pilot well in the immediate vicinity of the water treatment plant. This anticipated work is discussed further in this package.

LONG TERM: In the future when the studies of the pilot wetland systems are complete and Village wastewater volumes have increased, we anticipate constructing on the west side of the Village a complex of wetlands to enhance the natural environment, create habitat, and enhance the creek flows during the dry season. To provide the waste water plant operator a universe of locations to place re-use water for the benefit of the environment, additional consideration will be given to forest irrigation and facility use during seasons when there are sufficient flows to the creeks or precipitation events make this injection unreasonable.

PERMITS: Village staff will discuss and coordinate the wetland design and construction with other regulatory agencies. Early discussion with the USACE has occurred and the preliminary conclusion is that a 10/404 or 401 permit is required since no filling or dredging are anticipated. An NPDES construction permit likely will be required. The Village will raise the issue of an ESA - BA with Commerce and Interior, however no known endangered species are in the vicinity. Village staff has discussed grading, clearing, construction permits and NEPA compliance with the Tribal community development and will submit the appropriate documents when the design work is at ninety percent.

Therefore, the **specific request** of this application is to:

- re-authorize the current Class V Infiltration well for five years with flows at 9,125,000 gallons per month, and
- to authorize the operation of a pilot wetland with Class V infiltration pilot well for five years with average flows at 50,000 gpd (*in addition to the above request*).

SITE CONDITIONS

This section describes the Village's hydro-geologic conditions. Exhibit 6 indicates the locations of streams and other surface water features. Exhibit 7 provides a topographic map.

GENERAL HYDRO-GEOLOGIC PHYSICAL INVESTIGATIONS AND CONCLUSIONS

In 2002 and 2003, a thorough investigation of hydro-geologic conditions was completed for the entire Village. Details of these investigations were provided in appendices to the original application as the following appendix and are included herein by this reference:

Appendix A: *Summary of Geotechnical Studies, Effluent Infiltration Project, Tulalip, Washington* (AMEC Earth and Environment; March 15, 2002).

Appendix B: *Groundwater Infiltration and Mounding Study* (Pacific Groundwater Group, May 2002.)

The Village's original investigation of hydrogeologic conditions included 7 detailed soil borings, 8 cone penetrometer tests, 42 test pits, and 16 groundwater wells. Additionally, four long-term, high-volume infiltration tests were completed to evaluate aquifer properties and groundwater mounding. Exhibit 6 indicates the location of monitoring wells, infiltration well and proposed pilot wetland site. The information gathered from this study is supplemented by data from numerous other investigations of specific development sites around the Village. These other investigations have used soil borings, test pits, water level measurements, percolation tests, well pumping tests, and other methods to evaluate site conditions. Key conclusions derived from these investigations are:

The uppermost aquifer is unconfined in generally sandy soils that extend hundreds of feet below ground surface. The silt content of aquifer soils increases (and hydraulic conductivity decreases) to the south and west of the Village. Highlands immediately west of the Village are generally comprised of low-permeability glacial till.

Regional recharge is from precipitation, as well as from deep up-welling from infiltration occurring on the Tulalip aquifer higher lands to the west of this Marysville aquifer.

Seasonal/long-term variations vary from 3 to 4 feet.

Previous geotechnical evaluations reviewed Village soil conditions as reported from hundreds of test pits and reviewed data from numerous percolation tests to develop a recommended maximum infiltration rate. Based on these studies and current field work, a vertical infiltration rate of 33 inches per hour is appropriate. Several areas near the proposed pilot wetland with infiltration trench had infiltration rates that were greater, however the surface soils and proximity to the plant and creek make this site ideal for pilot test work considering that the ultimate objective is augmentation of this creek. To account for data uncertainty and subsurface variability, a safety factor was applied and the pilot infiltration rates will be commenced at a low rate before fully evaluating the system.

GENERAL GROUNDWATER QUALITY

Local area groundwater test wells (B-1, B-2, and B-3, Exhibit 6) were sampled in April 2002 to evaluate existing groundwater characteristics. A summary of the results is at Exhibit 8.

SURFACE WATER QUALITY AND FLOW RATES

Flow data in cubic feet per second (cfs) for lower the adjacent and receiving creeks indicates the following:

<u>Quil Ceda Creek Flows</u>	<u>Flow Rate (cfs)</u>
Year 2000 Summer/Fall Flow	6 to 7
Annual Average Flow	28
One-year Peak Flood Flow	95
<u>Coho Creek Flows at Pilot Site</u>	<u>Flow Rate (CFS)</u>
Year 2006 Summer Flow	0
Year 2006 Winter Flow	2 - 4
One-year Peak flood Flow	10 - 14

The proposed rates of effluent infiltration below are much less than the Quil Ceda Creek flows listed above.

<u>Proposed Effluent Infiltration Flow Rate</u>	<u>Flow Rate (cfs)</u>
First through third year averaged (up to 50,000 gpd) =	0.1 +/-

Groundwater moving under the area of the proposed pilot well test infiltration system flows northward and discharges to Coho Creek which empties into the lower portion of Quil Ceda Creek. Water quality in lower Quil Ceda Creek was sampled five times in 2001 as part of Snohomish County's *Ambient Water Quality Program* (Ecology, 2001). Results of this sampling work are summarized in at Exhibit 9. The primary water quality parameters of interest in recent studies of Quil Ceda Creek were dissolved copper, lead, and zinc; however, concentrations of these metals were measured to be substantially below State freshwater quality standards. Quil Ceda Creek nor Coho Creek are not listed on Washington State's 303(d) list of impaired water bodies.

DRINKING WATER WELL INVENTORY

The Village completed an inquiry to determine the locations of known drinking water wells within $\frac{1}{4}$ mile of the proposed effluent infiltration system. **No drinking water wells within $\frac{1}{4}$ mile were identified.**

Quil Ceda Village serves drinking water to the facilities east and northeast of the pilot site. Areas to the west are forested and not inhabited. Areas up-gradient to the pilot site are served by the Quil Ceda Village system.

TARGET COMPOUNDS, STANDARDS, ANALYTICAL METHODS AND REPORTING

LIMITS

In this application, we propose to continue the target compounds, standards methods and reporting limits advanced in the original application at Table 2-2. These are particularly appropriate for the operating I-5 well. The proposed pilot wetland section will discuss the target compounds regarding this phase of the project.

PILOT WETLAND SITE HYDRO-GEOLOGIC INVESTIGATION

LOCATION: The proposed site for the pilot wetland site is located north of the 88th street/27th avenue intersection about 950 feet, west of 27th Avenue about 1200 feet, and immediately northwest at 300⁰ from the treatment plant about 450 feet.

GROUNDWATER: Four test pits were excavated to the top of groundwater in mid March 2006, following one of the wetter seasons on record. Groundwater surface was present at 7 to 10 feet below ground surface. Groundwater flows northward, discharging to Coho Creek all of which is west of 27th avenue and immediately north of the MBR plant.

SOILS: The top foot is a sandy loam with significant percentage of organic material. The next foot of soil is a brown sand with about 5 percent clays, and about 95 percent medium to a fine sand. Soils at about three feet below surface and below turn to a gray colored medium sand with no clays.

VEGETATION: The area designated for this wetland project meets the definition forest. The area has a population of alder trees of various sizes up to 9 inches with scrub underbrush. Most of the surface vegetation is comprised of blackberries. Currently, there are no hydric soils of wetland plants

INFILTRATION TESTS: Three infiltration test pits were completed to define and verify infiltration rates. Infiltration tests were completed in pits, 2 feet by 4 feet by 3 feet deep, with total flows of up to 5,000 gpd for 90 days duration (exhibit 10). Ex-filtration rates were monitored after the input water was stopped (exhibit 11). The object of the test was to achieve a steady state and measure the flow and depths over a long period of time. Design of the pilot infiltration system has been based on this flow. One pilot test infiltration pit constructed to specifications will be built to verify this design analysis prior to developing the entire system.

RE-USE WATER QUALITY: Re-use liquid from the treatment plant meets drinking water standards. Given the general groundwater quality (Exhibit 8) and the temperature and dissolved oxygen of the re-use liquid, there was some concern that fish may not thrive in this water given other potential non-regulated contaminants that may injure or impact the natural environment such as endocrine disruptors.

As the initial base test, twelve salmonid smolting juveniles were placed in the operating infiltration test pits noted above. There was a five degree difference in the water temperatures when the fish were taken from a fish trap. Reuse water was flowing into the pit and infiltrating out at a rate of .48 gallons per minute.

The test objectives were: survival, feeding, general appearance

At the end of three weeks, the fish were feeding and appeared to be healthy. The fish were removed from the test pits and returned to the creek to migrate to the Sound.

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DESCRIPTION OF FACILITIES

QUIL CEDA VILLAGE

Quil Ceda Village is the economic engine and source of income and employment for the members of The Tribes and their future generations. The Village is located along the eastern boundary of the Tulalip Reservation, just west of I-5 between the 88th Street NE and 116th Street NE interchanges (Exhibit 1).

This 2,000-acre Village includes approximately 1,350 acres of developable property. For the purposes of wastewater planning, the Village separated the development into three segments or phases (see Exhibit 12). Phase 1 includes approximately 330 acres of land between I-5 and 27th Avenue. Phase 2 includes approximately 240 acres of land just west of 27th Avenue, and Phase 3 includes approximately 750 acres of land between Phase 2 and a natural ridge located approximately 1½ miles west of and parallel to I-5.

Phase 1 of the Village includes a large Casino, retail shopping malls, Bingo Hall, Wal-Mart, Home Depot and office buildings. Future Village development may include amusement park, RV park, electrical infrastructure, a university extension campus, another hotel, business offices, restaurants, and more retail stores.

EXISTING TREATMENT AND FORECASTING

Currently, all Village wastewater is treated by an ultra filter membrane plant located in the Village. The Tulalip Tribes have an agreement with the City of Marysville for 50,000 gallons per day (gpd) of treatment and conveyance capacity in an emergency situation via a pump station at the corner of 88th Street NE and Quil Ceda Boulevard and a 4-inch force main under I-5 to connect to the City of Marysville sewer system.

In 1990, a Wastewater Feasibility Study was completed. This report contained commercial wastewater flow projections of 1,700 gallons per acre per day (gpac) and "normal" Infiltration and Inflow (I&I) projections of 500 gpac. The Village continues to use 1,700 gpac for projected commercial wastewater flow and 500 gpac for projected I&I flow.

Following development of the Bingo Hall, Wal-Mart, Home Depot, the Mall, and the Casino, a review of actual wastewater flows reveal that flows are well below the 1,700 gpac commercial flow estimate and the current level of system I&I is well below the projected 500 gpac.

FUTURE FLOWS AND REUSE

Exhibit 13 summarizes projected wastewater flows expected upon completion of each of the development phases of the Village considering the earlier projections compared to actual flows.

The Village examined several alternatives for meeting their wastewater treatment needs, and constructed in 2003 as their preferred treatment a Membrane Biological Reaction (MBR) wastewater treatment plant. The plant has an installed hydraulic capacity of 1,600,000 gpd peak and with the base infrastructure for 4,000,000 gpd.

Long-term wastewater flow projections were again based upon 1,700 gpac of commercial flow and 500 gpac of I&I. While the initial comparisons of the projected to actual flows indicate that these numbers are overly

conservative, The Village considers these flow projections conservative enough for the preliminary projection. The wastewater flow projection numbers may be modified to more closely reflect the actual wastewater flow as construction progresses through the Village.

Short-term wastewater flow to the MBR plant and development within the Village has been limited by the ability to infiltrate treated effluent under the Underground Injection Control (UIC) Program. Currently, the design infiltration limit is 0.25 mgd. The preliminary design limit was established through groundwater modeling. A more complete description of the UIC basin and design parameters was included in Section 4.6 of this Sept 2003 report and is incorporated herein by reference.

The Village ultimately desires to constructively re-use this treated effluent to augment several proposed projects. These projects include landscape irrigation, non-potable water use inside Village buildings, salmon rearing ponds, constructed wetlands, and stream augmentation.

PRETREATMENT

The Village is concerned about maintaining a consistently high-quality effluent so that groundwater or surface water is not degraded and wastewater treatment plant sludge quality is not impaired. The Village recognizes that a credible wastewater pretreatment program is a key component to achieving this goal. Pollutants of concern could originate from sources as diverse as photo processing, vehicle and facility maintenance shops, and heavy industry. We currently have none of these operations in the Village and is reluctant to lease to this type activity. Currently, there are **no industrial processes in the Village that discharge to the sanitary sewer.**

The Village has developed a preliminary pretreatment regulation to aid in managing discharges to the sewer. A copy of the regulation is provided herein. The industrial waste program is intended to control the discharge of hazardous substances and oils and greases that could be detrimental to the sewer system, including the new wastewater treatment plant. The three key elements of the program are:

Restrictions on the types of businesses and industries accepted as tenants in the Village.

Requirement for pretreatment of discharges containing pollutants of concern from businesses and industries.

Prohibition of certain substances in discharges to the sewer system.

Decisions regarding these issues are made by the City Manager, acting upon recommendations from the Public Works Director and the Department of Natural Resources. The Village will obtain the assistance of outside experts, as necessary.

MEMBRANE WASTEWATER TREATMENT PLANT

Treatment Plant Description

The wastewater treatment plant is an activated sludge plant that includes nitrogen removal. Vendor literature and preliminary plans were provided in the original application. The plant uses flat plate membranes ultra filters to

separate the effluent (permeate) from the activated sludge in lieu of mechanical clarification. The use of membranes allows operates at a concentration of mixed liquor suspended solids (MLSS) in the range of 10,000 to 18,000 mg/L. This greatly reduces the amount of volume necessary to treat the wastewater compared to a typical activated sludge plant. Tanks are provided to create an anoxic environment for nitrogen removal. Recycle pumps send approximately five times the influent flow back to the anoxic tanks from the aerobic membrane bio-reactors. This allows the de-nitrification of the recycled biomass that has been nitrified in the aerobic zone. This level of recycle allows for 80 percent plus reduction in overall nitrogen.

Air supplied to membranes provides oxygen to the biomass and clean the membranes at the same time. A separate aeration basin is provided to ensure adequate oxygen is supplied.

The flat plate membranes are in cassettes of 800 plates. These are stacked units with 400 in each level. The distance between the membranes is $\frac{1}{8}$ inch. This small tolerance requires adequate screening of the influent to insure that nothing gets lodged between the membranes to potentially damage the membranes. A primary screen ($\frac{1}{4}$ inch) is located at the pump station upstream from the treatment plant. A secondary ($\frac{1}{8}$ inch) screen is located at the treatment plant. This screen is located just downstream of a grit removal system.

The membranes provide significant disinfection since most bacteria are larger than the effective membrane pore size of .1 micron. A chlorine residual is available for any re-use water that may be used for flushing, fountains, ponds, and irrigation. Ultraviolet (UV) disinfection is provided for the discharge to the effluent infiltration system as a backup to the membranes and to kill viruses in the effluent.

A record of the base operating regimen with flows and consistency of the mixed liquor is included at exhibit 14.

WASTEWATER TREATMENT PLANT DESIGN CRITERIA

The wastewater treatment plant was designed using the following criteria:

Phase I Criteria

- 0.75 mgd Maximum Month Flow
- 2.5 mgd Peak Hour Flow

Ultimate Criteria

- 4.0 mgd Maximum Month Flow
- 9.5 mgd Peak Hour Flow

Headworks

- Screen ($\frac{1}{8}$ -inch perforated screen): One screen at Phase 1, second installed as flow dictates.
- Pre-screen ($\frac{1}{4}$ inch): Located at upstream pump station.
- Grit Removal (Twin "Grit King" units): One installed at Phase 1, second installed as flow dictates.

Pre-MBR Tanks

- One Post MBR Basin (recycle from MBR basins; design flow is five times the plant influent flow rate): Required to lower dissolved oxygen level in activated sludge to allow for anoxic conditions in next basin; May be used as anaerobic tank in the future; Level of recycle needed for nitrogen removal.
- Two Anoxic (De-nitrification) Basins: 21 feet by 21 feet; 66,000 gallons at 19-foot water depth.
- One Pre-MBR Tank: Aeration as required; 14 feet by 43 feet; bottom elevation at 10 feet; Aeration not needed until flow is approximately 0.6 mgd.
- Three Mixers: Complete mixing in Post MBR and Anoxic Basins.

MBR Tanks

- Four Tanks: 14 feet by 29 feet 7 inches; Water depth 19.5 feet to 22.5 feet.
- 24 Total Double Stack Membrane Units: 8 per tank; one tank for overflow purposes only.
- Air Requirements: 790 cubic feet per minute (cfm) minimum and 850 cfm maximum per tank; Coarse air.

Recycle

- Six Pumps Total: 3 per side; Phase 1 maximum flow B 1.25 mgd per tank.

Sludge Disposal

- Wasted sludge is sent to either the existing Tulalip treatment plant or trucked to King County (under contract). No separate solids treatment or processing is included at the Quil Ceda Village treatment plant as of this writing; however, we have budgeted for a sludge thickener and sludge dryer. We anticipate this project will be completed in late 2007.

EXISTING EFFLUENT QUANTITY

The quantity of plant effluent is recorded at the plant on a daily basis and as input to each well section via a flow meter with totalizer. One hundred and thirty seven million gallons have been injected over a thirty seven month period averaging 3,711,600 gallons per month. A record of the quantities injected at each well section by month and the operating regimen are included at exhibit 4. While rates impact on groundwater are discussed later in this document, it is apparent that the gallons injected over the 37 month period have not had a hydrological impact on the local groundwater.

EXISTING EFFLUENT QUALITY

The effluent from the plant has been sampled frequently. The basic data is included at exhibit 15). Additional exhibits (16 thru 24) provide a listing with graphs of specific parameters. A comparison of the treatment plant water to the Quil Ceda Creek is at exhibit 25.

Base water quality: The temperature, dissolved oxygen, turbidity, Ph have been within standards. The nitrogen compounds from time to time have been a concern. On occasion the effluent spiked to just over the standard of 10 mg/L as reported in the exhibits. In each instance the operator retested and the sample was within standard. Nevertheless, this causes some concern and will be a major factor in the wetland design.

Metals: For the three years of operation, samples of the plant's effluent have been analyzed for metals on three occasions. In each case, no analyte was out of limits. The results are shown at exhibit 26.

Radiochemical analysis: For the three years of operation, samples of the plant's effluent have been sent to the laboratory in Richland WA for analysis of its radiochemistry. The results are included at exhibit 27.

EXISTING EFFLUENT INFILTRATION FACILITY DESCRIPTION AND ANALYSES

Effluent Infiltration System Description

This section describes the effluent infiltration system, including construction plans, design criteria, and analyses.

The system is designed as a series of 19 identical individual sections, each 250 feet long and 5 feet wide. Construction details of a typical well section is shown at exhibits 28 & 29). Each section contains 10 individual discharge points located 25 feet apart. Flow to each section is controlled via a vault that contains a float valve, totalizing flow meter, and a globe valve for fine flow rate adjustment. Each discharge point has a valve to provide for flow rate control. These flow controls provide equal flow to all sections and discharge points despite varying head losses due to 1) varying distribution piping lengths and numbers of fittings, and 2) elevation changes (ground elevation varies from 47 feet at the south end of the system to 62 feet at the north end of the system).

The float valve provides restriction, and eventual shut-off, of flow to its respective infiltration trench section. Mounding of water above the bottom of the trench has not occurred even under peak-hour flow conditions; however, the float valves provide a contingency measure. If one infiltration section shuts off, flow naturally increases to the other sections. Sensors at the treatment plant continuously monitor effluent discharge flow and pressure in the transmission pipeline to the infiltration system. Shutdown of one or more infiltration sections causes an increase in back pressure due to increasing head loss as a result of high flows through distribution piping in each section. The treatment plant computer monitoring system automatically alerts the treatment plant operator to any unusual conditions so that the operator can investigate and take corrective action as necessary.

The infiltration trench was excavated to a depth of 4 feet to remove surficial topsoil and low-permeability silty sand, and then backfilled with a higher permeable material coarse sand providing for a rapid flow of injected water to all portions of the infiltration basins.

During construction, plastic sheeting was laid over the top of the infiltration trench. This plastic was removed prior to startup of the effluent infiltration system. The purpose of the plastic was to prevent introduction of topsoil, landscape bark, and other foreign matter into the trench during construction of landscaping and other work adjacent to the trench.

Hydraulic Design Criteria

The original groundwater mounding was evaluated using a combined local/regional modeling analysis that

predicted that groundwater mounding directly under the infiltration basins would be less than 3 feet. In actual use, the mounding has been less than 2 inches. The groundwater mounding analysis considered the following:

Groundwater recharge from effluent infiltration and groundwater recharge from precipitation in unpaved areas.

Groundwater recharge from the casino storm water infiltration basins.

Groundwater recharge by storm water infiltration basins for other major developments, including Wal-Mart and Home Depot.

Rainfall is not a significant source of water to the effluent infiltration system. Average rainfall at the site is approximately 33 inches per year. Only a portion of this water actually infiltrates, since some evaporates or runs off as surface water.

Surface water has not flowed into the infiltration system, because the system is located on a ridge between Quil Ceda Boulevard and I-5. The ground to the west of the infiltration system drains westward to Quil Ceda Boulevard. The ground to the east of the infiltration system drains to the east to the I-5 drainage ditch.

Operating Regimen

The general operating regimen can be best observed by reviewing the chart at exhibit 4 which shows the volume infiltrated by months and indicating which I-5 well sections were in operation. When the well sections were first brought into service, the entire system was opened and operated for a three week period to fully consider the hydraulic flow and groundwater hydraulic impact. Monitoring wells were examined daily to determine the hydraulic impact on the groundwater along with observations of the control boxes positioned in the tops of the basins. Clearly the injection of 80,000 gpd and distributed among 19 sections over a 4,000 foot distance did not impact groundwater levels. One half of the system was shut off and the ten north sections were observed in the same manner for three weeks. Again, there was no hydraulic impact to the groundwater. Therefore, to fully understand the system, all but three sections (*to provide for maximum peak hydraulic flow*) were placed in standby service and the three sections were observed daily. The groundwater levels continued in a steady state with the 80,000 gallons +/- per day into three wells. The hydraulic issues were certain: the 3 inch piping (the limiting factor) for one well section would not provide for the full hydraulic capacity flow for one day; two could handle that volume. A third well section provided for a factor of safety for peak flows that might occur during busy peak days. The system has operated in the three/four well section configuration for three years. The three sections selected for operation have been varied to fully examine the hydraulic nature of the infiltration here.

Impact on Groundwater Levels

The infiltration of more than 137 million gallons of water over the 4,000 foot horizontal well in a 36 month period has not had an impact on the groundwater levels adjacent to each section. The quantities injected are listed at exhibit 4. The ground water levels taken at the same time as the reading from the flow meter totalizer are shown at exhibit 5. The bottom rows on this chart demonstrate the average depths, minimum and maximum and provides for the generalization of the impact by comparing the minimum to the maximum levels. Considering the seasonal variation in the range of 3 to 4 feet, the maximum impact in mounding can be considered to be in the extreme range of 1 to 2 feet. Examining the readings for well North #2, with the lowest total infiltration of 1.7M gallons, the difference in minimum and maximum readings was 2.9 feet. Contrast this reading to the well with the most water infiltrated North #7, the total infiltration was 19M gallons with a groundwater difference of 4.8 feet. The reader might conclude that the mounding at this rate was on the order of 1 foot. Exhibit 30 compares by a line

graph chart the relationship of infiltrated volumes to difference in levels during the operating period. It is apparent that there is some impact, however minimal. Exhibit 31 visually demonstrated the maximum and minimum groundwater elevations during the three year period of operation.

Pollutant Loading Rates

An analysis of pollutant loadings over the design life of the infiltration basins demonstrated that loadings of total suspended solids, precipitable solids, and biological matting should not caused any reductions in infiltration rates; operational experience affirms this analysis. Reduction in infiltration rates has been slight and well within the margin of safety that has been provided by a safety factor of 3 in the design infiltration rate. The pollutant loading analysis conservatively assumed the following:

Total suspended solids of 0.4 mg/L. All suspended solids has been less than 0.1 microns in diameter, much less than the pore diameter of the sandy soil (fine sand has a typical particle size of 100 to 400 microns).

Total precipitable solids of 171 mg/L, of which 50 percent precipitates in a 2-foot-deep zone immediately below the bottom of the coarse trench backfill.

Carbonaceous Biological Oxygen Demand (CBOD) of 2.8 mg/L, of which $\frac{1}{3}$ is transformed into biological growth in soil pores in a 2-foot-deep zone immediately below the bottom of the coarse trench backfill.

Soil porosity of 0.3.

Nitrification of total Kjeldahl nitrogen (TKN) yields minimal cell growth of only 0.05 gram cells per gram of nitrogen (oxidized); bio-fouling from nitrification has been negligible.

Oxygen Demand/Aerobic Conditions

The effluent infiltration system is maintained in an aerobic condition to avoid odorous conditions and to aid aerobic bio-degradation of accumulated organic matter. Oxygen demand occurs from BOD and TKN in the effluent. The wastewater treatment plant membrane tanks are well aerated, so effluent chemical oxygen demand has been minimal. Oxidation of 1 mg/L of TKN to nitrate requires 4.6 mg/L of oxygen. Conservatively assuming a BOD of 2.8 mg/L and a TKN of 2.7 mg/L, the total oxygen demand is:

$$2.8 \text{ mg/L BOD} + 2.7 \text{ mg/L TKN} (4.6 \text{ mg/L O per mg/L TKN}) = 16 \text{ mg/L}$$

The effluent has a dissolved oxygen concentration of approximately 3.6 mg/L; however, oxidation of TKN is a process that takes weeks to occur at temperatures less than 60°F. Due to pump cycling requirements, effluent is being discharged to the infiltration basins in pulses at a high flow rate of approximately 1,000 gpm +/- (and hence a high infiltration rate of approximately 6 inches per hour) rather than in a continuous low flow manner. The duration the pump times are determine the day's total flow. This manner of effluent infiltration maintains aerobic conditions at the vadose zone by drawing air into the soil pores as the pulse of applied effluent migrates downward. Additionally, wastewater flows follow a diurnal cycle of peak flows in the morning and evening, with lesser flows at night. This diurnal cycling aid in maintaining aerobic soil conditions. Assuming air is drawn into the subsurface soil at a rate of 0.1 L air per 1 L of effluent applied, an oxygen content in air of 21 percent, and a density of oxygen gas of 1,430 mg/L, oxygen would be re-supplied to the effluent as follows:

This re-supply of oxygen is three times the net oxygen deficit of 10 mg/L. Therefore, the effluent infiltration system, underlying vadose zone, and aquifer is maintained in an aerobic condition. Groundwater monitoring wells located directly under the effluent infiltration basins allow for direct monitoring of shallow aquifer oxygen levels.

INFILTRATION WELL FLOW RATE APPROVED IN ORIGINAL APPLICATION:

The 2003 application approval provided for a maximum flow to the I-5 infiltration well a volume of 250,000 GPD. As described above, three well sections have been the operational mode for three years providing the infiltration capacity with no impact to the groundwater levels. Sixteen well sections were on idle stand-by.

PROPOSED INFILTRATION WELL FLOW RATE TO THE I-5 WELL SYSTEM:

The request by this application is to amend the rate of infiltration. We propose that the rate be adjusted to 300,000 GPD understanding that this new rate is well within the capacity of the current system with a significant factor of safety. Further, we propose that the rate be further adjusted to a maximum volume per month. By example, consider the rate of 300,000 GPD x 365 days = 109,500,000 Gallons Per Year divided by 12 months equals 9,125,000 Gallons Per Month for the existing infiltration well system on the east side of the Village. This request is to adjust the approved injection volume to 9,125,000 gallons per month.

PROPOSED PILOT WETLAND WITH CLASS V INJECTION PILOT WELL SYSTEM:

PURPOSE: The Village desires to construct and operate a pilot re-use wetland with class V infiltration pilot well system to examine methods and techniques to pass this re-use water to surface waters in the most constructive and safe way while benefitting the environment. An overhead photo of the specific location for the project is shown at exhibit 32.

OBJECTIVE: In anticipation of greater flows and with regulatory understanding and approval of this package, we anticipate constructing a pilot wetland system as a 'no surface water discharge pilot investigation program' to determine the impact of this treated water on the environment, to determine how best to migrate water into existing surface waters, to investigate the phenomena of marking this water for anadromous fishes, and to investigate the nature of endocrine disruptors in the re-use water. This pilot program will provide for a series of wetland configurations with free flow regimen and subsurface flows with different plants and different plant growing media. Infiltration tests in this area indicate that the northern portion of this site will support infiltration flows at 50,000 gpd with a factor of safety. We anticipate constructing this pilot wetland with Class V infiltration well (with three sections) in the immediate vicinity of the water treatment plant. This anticipated work is discussed further in this package.

LONG TERM: In the future when the study of the pilot wetland systems are complete and the wastewater volumes of the Village have increased, we anticipate constructing on the west side of the Village a complex of wetlands to enhance the natural environment, create habitat, and enhance the creek flows during the dry season. To provide the waste water plant operator a universe of locations to place re-use water for the benefit of the environment, additional consideration will be given to forest irrigation and facility use during seasons when there are sufficient flows to the creeks.

CONCEPT: After a review of the existing literature, discussions with natural resources staff, and a topography map made of the area, a concept layout was developed (Exhibit 33 & 34). This concept layout is provided here as information in that it stands as the basis for further refinement by a learned professional academic design team. A topo of the area with two cross sections are displayed at Exhibit 35.

INITIAL FEASIBILITY ANALYSIS:

POTENTIAL SITES: Tribal staff gave significant attention to a survey of various locations at which to design, construct, and operate a pilot wetland. The site needed to be level, near a water body that went dry in the summers, reasonably near the water source, not have high groundwater levels, not have wetland characters, and have soils capable of infiltrating significant quantities of water without mounding.

THE SITE: A site was chosen approximately 500 feet northwest of the water treatment plant (see exhibit 7 & 32). The site was surveyed by a licensed surveyor to develop a topographic map in order to ascertain if site hydraulics would support a wetland without significant quantities of soils import or export. Based on historical photographs, it appears this site has been always been forested. In the mid 1940's, and on the north side of the adjacent creek, a train track was constructed by the U.S. War Department. A small aluminum foot bridge was constructed to provide access to a small wooden warming shack on the site of this project. The decayed wooden shack is still at the site and has been nearly demolished by tree growth.

INITIAL INVESTIGATION: In March 2006 following a very wet winter, four test pits were dug to the groundwater surface to determine the nature and flow of water at the site. Static levels at the north side of the site were at seven feet below surface and levels to the south were at four feet below surface. Test pits that were dug in the previous infiltration analysis in 2002 and excavations in the late summer of 2002 demonstrated that the levels in the summer at the south side of the site were at six to seven feet.

SOILS: Soils removed from each pit in one foot layer were placed in containers for further analysis. From surface to approximately one foot below the surface, the soils were a sandy loam with a high percentage of organics from the detris of multiple years. From the one foot level to the three foot level the soils are light brown and consist of a medium to fine sand with some clays evident. Below the three foot level, the soils turn to a gray color and consist of a medium to fine sand with no evidence of peat or clays.

INFILTRATION: To fully consider the potential for infiltration, three locations were chosen to construct test pits to measure the rate of infiltration. Three pits, each approximately two feet wide, four feet long and three feet deep were constructed and a water source with control valve placed at each location. The details of the work are described at Exhibits 10, 11 & 36. The conclusion is that water infiltrates at this location with minimal mounding. The rates observed in the test pits are the design factors considered in the design of the final infiltration pits. Construction details for the proposed Class V well are at exhibit 37.

INTRODUCTION OF FISH: To confirm the laboratory work and to insure the project was not in vain, the team decided to determine if a fish species of concern could live for a short period in the test pits. Twelve smolting juvenile salmonid were placed into the test pits (four in each pit) and observed on a daily basis. As the days progressed, it was apparent that the salmon were feeding on insects at the surface. After three weeks, the salmon were removed from each pit for observation. The natural resource staff, accustomed to working with young salmon at the Tribe's hatchery, observed that the fish were in good health. The fishes were returned to Coho Creek.

DESIGN GOAL: The information above is being used to determine the scope of the project. The goal of the project is provide three pathways for water (see the concept plan at Exhibits 33 & 34).

One path is a base line flowing from the plant to the infiltration pit. Sampling points will be placed at the entry to the infiltration pit.

The second path is flowing into a pond that will provide the habitat for resident fish. We anticipate this pond will be approximately three to four feet deep. Air may be provided to this pond as oxygen conditions dictate. The pond will be positioned to provide some sun light to the surface water. After two years of operation, we anticipate removing the fish for full laboratory analysis and compare these fishes to resident fishes in Coho Creek.

The third path is into a series of wetlands. We propose, based on the amount of elevation available to construct a series of wetlands with subsurface and free flowing waters with a variety of plants to determine the impact of these soils and plants on the water. As in pathway one and two above, a variety of sampling points will be constructed to assist in determining the full impact of each path and wetland type on the waters.

The projects current flow rate goal is fifty thousand gallons per day. The object is to begin the project with an equal volume of water (17,500 gpd) flowing to each pathway. As conditions develop, the flows may be adjusted for the sake of enhancing the investigation. The base pathway will be of sufficient size that it could take the full volume of water for short periods in reduced flows are required in the other two pathways. In any catastrophic event, the waters could be shunted back to the infiltration pits at I-5.

WETLAND DESIGN: The Village has teamed by contract with the University of Washington to assist in the design scope, goals and writings to develop this pilot scheme. See the statement of work at exhibit 38. A tenured professor (Dr. Stensel) in water studies and a professor in civil engineering will present various layouts, sampling and monitoring program, and design the final setup. A graduate student will perform monitoring for the first year thereafter. This test program is consistent with other work both professors are currently performing in the State of Washington.

INJECTION WELL DESIGN: The infiltration well sections are to be considered as a horizontal injection well. Three sections will be constructed (exhibit 33) in the location shown on the concept plan. One section on the west side will be sized for the entire flow to be operated at that rate only in extraordinary conditions. Generally, any maintenance shut down would require the water to be diverted to the original I-5 operating well. The other two well sections will be sized for 17,500 gpd with a factor of safety. Each will be 55 feet long, 12 feet wide and 4 feet deep; lined on the bottom and sides with filter geo-fabric, filled with 2 inch round rock with perforated pipes distributing water through the section. Each well section will be have a control vault equipped with a flow meter, sampling port and control valves. Each section will have a monitoring well placed within 3 feet to monitor groundwater levels. The complete flow from the wetland pathways will be placed into the infiltration pits until a full determination is made as to if and how to migrate the waters into Coho Creek with an approved NPDES.

OPERATIONAL STRATEGY: Initially we will provide one third of the approved flow (17,500 gpd) to each pathway identified in the concept drawings. Given time and sampling date, we anticipate increasing/decreasing the flow to the each pathway to further study the impact of flows on the media and resulting water quality.

WATER QUALITY: In this application for the I-5 well and the proposed pilot wetland well, we propose to continue the target compounds, standards methods and reporting limits advanced in the original application at Table 2-2.

When the infiltration test pits were operating (as discussed above), we did consider the question of the effect of this existing water to the fish population. We determined by introducing fish into the water for a test period, that the fish survive for a short period with no obvious impact. This pilot test provides for a pond arrangement to further consider the long term impact of this specific water to fish.

We do recognize that the temperature and the dissolved oxygen may be of a concern for the pathway containing the pond. We currently anticipate that the aggregate temperature will quickly drop with exposure to the surface soils and air temperature, however the low dissolved oxygen may require that part of the pathway be a shallow stream with a brief section of rough waters (babbling brook effect), or may require aeration to keep the dissolved oxygen above the freshwater standard. The Ph levels should not be a problem for this pilot wetland.

Nitrogen compounds are a concern. There have been spikes in the effluent from time to time of nitrate and ammonia. This will be the primary factor driving the design of the pilot wetland pathways.

In any of these parameters, the background of Quil Ceda Creek and specifically Coho Creek will be the parameters for comparison. We do not have current data for the creek for the nitrogen compounds. This sampling will commence shortly to establish a baseline for the pilot wetland. The chart at exhibits 16 & 19 demonstrate that turbidity and Ph should not be a concern. However, as noted above, the temperature and the dissolved oxygen (exhibit 25, 17 & 18) will be the goal for the down stream end of the wetland.

SAMPLING PLAN: The University of Washington contract provides for the University preparing a sampling plan to be in concert with the specific pathway design. Sampling ports or valves will be built into the wetland system.

STANDARDS: For re-use water entering (plant effluent) the wetland, we propose to maintain and comply with the standards advanced and approved for the I-5 well (QAP table 2-2, page 16). For water exiting the wetland complex into the infiltration well, we propose to comply with the same standards for all analytes. With that standard in mind and in the unlikely situation where natural events in the wetland produce analyte levels outside of that standard, yet within the background of the target creek, we will present evidence of these events to regulators and discuss the rationale of alternative systems or standards. Presented at exhibit 25 is a comparison of the base standards with existing data from the plant's effluent to the creek and to freshwater and human health standards. Routine quality sampling of the creek immediately adjacent to the proposed wetland will commence in December 2006.

EFFLUENT MONITORING PROGRAM

The Village developed the following plans with the goal of ensuring the (1) environmental programs and decisions support the data of the type and quality needed and expected for their intended use, and 2) decisions involving the design, construction, and operation of environmental technology are supported by appropriate quality assured engineering standards and practices:

Quality Management Plan (QMP) Describes Tribal and Quil Ceda Village Management commitment, roles, and responsibilities to ensure the overall quality and integrity of environmental data and decisions.

Quality Assurance Plan (QAP) Describes specific quality control parameters and quality assurance procedures, including personnel roles and responsibilities to ensure project quality objectives are achieved. Primarily applicable to public work director and staff.

Sampling and Analysis Plan (SAP) Describes specific sampling procedures and requirements. Primarily applicable to the wastewater treatment plant operator/field technician.

These plans are provided herein. Wastewater treatment plant operation and maintenance, including monitoring of operational parameters (i.e., flows, aeration rates, etc.), is covered in a separate document.

The SAP and QAP provide monitoring program requirements applicable to both effluent infiltration and discharge to surface water. The intent is to allow for a seamless transition in monitoring at such time as an NPDES permit is obtained, without requiring preparation of new monitoring program documents.

The SAP addresses two primary issues:

Effluent quality monitoring.
Groundwater level monitoring.

Because effluent meets federal drinking water quality standards at the point of infiltration, the Village completes no routine groundwater quality monitoring. Groundwater quality is monitored only as a contingency, cross check measure.

Effluent Quality Monitoring

Effluent is monitored to document compliance with federal drinking water quality standards. Exhibit 39 summarizes the effluent monitoring parameters and frequencies for discharge to groundwater for the current I-5 monitoring well and the proposed pilot wetland infiltration well. The quality standards are found in the Quality Assurance Project Plan at page 16, table 2-2.

Groundwater level monitoring

Nineteen groundwater monitoring wells are installed along the length of the effluent infiltration system to aid in monitoring groundwater levels and mounding due to infiltration of treated effluent. These wells are monitored monthly.

Additional groundwater monitoring wells (B-1 to B-6) located around the perimeter of the Village aid in evaluating regional/seasonal variations in groundwater levels. Groundwater levels in these wells are monitored periodically.

PLUGGING AND ABANDONMENT PLAN

The effluent infiltration system will be shut down and abandoned in-place in due time. No specific plugging measures are proposed to be implemented following shutdown of the effluent infiltration system, because all effluent infiltration will occur subsurface in shallow trenches. The effluent infiltration system will have no deep wells or other vertical features that would provide a migration pathway for contaminated water into the aquifer.

All accumulations of solids and/or biological material will be located approximately 3 or more feet below ground surface, thus preventing any contact with people or wildlife. As discussed in Section 4.5.2, the wastewater effluent will be disinfected and meet federal drinking water standards. Thus, the accumulated material will be non-hazardous. Future excavation work that exposes these soils will require no special soil management procedures or institutional controls.

The surface of the effluent infiltration trenches have been finished in decorative fashion with landscaping rock. This material will be retained in place unless future landscaping changes require it to be removed and replaced with topsoil.

SCHEDULE

Project History and Proposed Schedule

Item	Date
Treatment plant and UIC began operation	May 2003
Conceptual work for Pilot Treatment Wetland	Winter 2006
Preliminary testing on pilot wetland infiltration pits	April 2006
Fish survival analysis	June 2006
Preliminary presentation to EPA	July 2006
Design and construct head pipe for pilot wetland	July 2006
Design infiltration pits	Sept 2006
Negotiate, develop and sign contract with U W Water Program for design assistance	Sept 2006
Submit revised Application by Rule to EPA	Oct 2006
Preliminary design testing on one infiltration	Nov 2006
Design wetlands	Winter 2007
Construct wetlands	Summer 2007

^a Based on the planned development schedule, Quil Ceda Village may need to obtain an NPDES permit for discharge of treatment effluent to surface water in late 2010. This schedule is based on the current development plans and corresponding wastewater flow rate projections, which indicate that future wastewater flow rates will exceed the capacity of the effluent infiltration system in 2010. The actual schedule for obtaining an NPDES discharge permit to surface water will depend primarily on when an NPDES permit is needed, as a result of effluent flow rates approaching the capacity of the effluent infiltration system. Future wastewater flow rates may be less than anticipated (due to the amount or type of development that actually occurs), or the capacity of the effluent infiltration system may be greater than anticipated. In either event, Quil Ceda Village may continue to rely on the effluent infiltration system for disposal of treated wastewater as long as it is feasible, which could be indefinitely. Quil Ceda Village will closely monitor and evaluate actual wastewater flow rates versus projected flow rates, and closely monitor the capacity of the effluent infiltration system, to ensure that a decision to obtain an NPDES permit is made in a timely manner.

CONTINGENCY PLAN

This section addresses contingency measures applicable to several potential problems that might affect the effluent infiltration system. These potential problems include:

- Treatment plant effluent quality does not meet federal drinking water standards.
- Sanitary flows exceed effluent infiltration system capacity.
- NPDES discharge permit to surface water cannot be obtained.

These issues are discussed in more detail below.

EFFLUENT QUALITY EXCEEDING FEDERAL DRINKING WATER STANDARDS

Effluent quality is a function of a number of several parameters, including:

- Drinking water supply quality.
- Sanitary discharge water quality.
- Treatment plant removal efficiencies.

In the event monitoring indicates an exceedance of federal drinking water standards, the Village will complete an investigation to determine the cause of the exceedance. Possible investigation and corrective action steps could include:

- Collecting and analyzing samples of the drinking water supply.
- Collecting and analyzing samples of the effluent from specific sources of concern that discharge to the Village sewer system (see Sewer Utility Code Section 1.04.213), and requiring termination or pre-treatment of excessive discharges.
- Evaluating and improving treatment plant operations, maintenance, and/or equipment.
- Installing and monitoring new off-site groundwater monitoring wells and/or monitoring existing off-site drinking water wells to evaluate groundwater quality down-gradient of the effluent infiltration system.
- Providing alternative drinking water supplies to persons relying on potentially affected wells for drinking water.

The City of Everett provides the Village's water supply wheeled through the City of Marysville; and therefore, the Village has minimal control over the quality of the drinking water supply. The City of Marysville's water supply is primarily from the City of Everett, although some additional water is obtained from local surface water and groundwater. The Village will work with the City of Marysville to address any water supply issues (such as attainment of the new 10-µg/L arsenic standard); however, water supply issues may be beyond the Village's control. The Tribes may request a variance from EPA for meeting specific federal drinking water standards for substances that exceed the standards in the water supply.

The Tribes has an agreement with the City of Marysville allowing The Tribes to send up to 50,000 gpd of sewage to the Marysville POTW providing a contingency measure to reduce flow to the effluent infiltration system in the event of a wastewater plant malfunction or other problem. This may be useful particularly in the event of difficulties with system startup when wastewater flows will be relatively low.

An ultimate long-term remedy in the event of severe problems with the new treatment plant is construction of an overland pipeline to The Tribes' existing sewage treatment plant located on the west side of the reservation. This plant currently discharges to Puget Sound, and it has an NDPES Discharge Permit with sufficient excess capacity to accept flow from the Village; however, construction of the required pipeline (approximately 7 miles) would take 6 to 12 months from the time that it was determined to be needed.

Insufficient Infiltration Capacity

However unlikely, insufficient infiltration capacity could occur for the following reasons:

- Higher than expected wastewater flows due to rapid development of the Village, higher than expected flows from specific businesses, and/or excessive interception and infiltration of groundwater into the sewer system.
- Lower than expected effluent infiltration capacity due to infiltration trench plugging and/or groundwater mounding.

The Village will monitor and evaluate sanitary flows to the treatment plant, and control the Village development, so that flows increase in an incremental and controlled manner and do not exceed allowed rates. The Village is limiting development to a level that can be serviced by available utility capacity. The Village has a stringent construction inspection and quality control to limit interception and infiltration of groundwater to the sewer to reasonable levels. The Village will attempt to identify and remedy specific sources of excessive groundwater interception and infiltration.

The Tribes has an agreement with the City of Marysville allowing The Tribes to send up to 50,000 gallons per day of sewage to the Marysville POTW providing a contingency measure to reduce flow to the effluent infiltration system. This emergency capacity together with two 50,000 gallon buffer tanks, and the proposed 50,000 GPD pilot wetland provides one day emergency capacity.

Lower than expected infiltration rates are not expected to occur due to infiltration of only high quality effluent and short project life; however, in the long run it is possible that the trench infiltration rates could decrease. Trench plugging would be identified by the shut-off of float valves controlling flow to individual branch sections, and by ponding in the trenches while the groundwater surface remains below the trench bottom. Trench plugging could be investigated using test pits and/or soil cores within the infiltration trenches. Excessive groundwater mounding and elevated regional groundwater levels would be detected by routine groundwater level monitoring. Causes of lower than expected infiltration rates, and associated potential corrective actions, are described

below:

- **Biological Matting** – For each section, revise the effluent application scheme to implement infiltration on an alternating cycle of application and resting. Alternatively, “shock chlorinate” the effluent with a moderately high dose of chlorine to kill accumulated biological material. Note that the effluent will normally be disinfected with ultraviolet light as described elsewhere in this application.
- **Solids Accumulation** – Excavate the trench in sections to remove accumulated solids. Replace the trench backfill with new material. Scarified or over-excavate and replace trench bottom soils. Use temporary bypass piping to maintain flow to downstream infiltration sections.
- **Groundwater Mounding** – The gradual rise in effluent flows from low initial rates will provide adequate advanced warning of any potential problems. If excessive groundwater mounding is limited to an individual infiltration section (possibly due to variations in soil permeability), reduce the effluent flow to that section.

For all three causes listed above, additional infiltration capacity to offset lower than expected infiltration rates could be provided by constructing additional infiltration basins in the vacant lot north of Home Depot or other areas of the Village.

NPDES Discharge Permit to Surface Water Cannot Be Obtained

If needed, the Village believes it will be eventually able to obtain an NPDES Permit in a timely manner; however, it is possible that an NPDES Permit may not be obtained as planned. The Village would then have two options:

- Continue discharging treated effluent to the infiltration system.
- Discharge treated effluent to Puget Sound.

REFERENCES

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